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Haldane, 研究

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p. 29 He (Kant) concluded that we judge of an organism as a whole which expresses itself in innumerable specific particulars of form and behaviour. Yet it appeared to him that in our definite perceptions of living organisms we only discover phenomena which we can interpret in accordance with the mechanical conceptions of the physical science.

p. 32 There was thus an essential contradiction between vitalism and Kant's conclusion According to the vitalists the phenomena actually perceived in living organisms are perceived as manifestations of what Kant relegated to an unperceived universe of aesthetic judgement.

p. 41 While these writers point out clearly the difficulties in any mechanistic interpretation of life, The fact that all the phenomena of life seem to depend ultimately on environmental conditions led to the abandonment of vitalism, even if we extend vitalistic conceptions so as to include phenomena met with in what has hitherto been regarded as the inorganic world.

When we examine closely the characteristic features of life we find that although every part and activity of a living organism or of the environment connected with it appears to be determined by its relations to other parts and activities, yet the determination is normally so co-ordinated with other parts and activities that the specific structure and activities of the organism are maintained or reproduced, Hence to

p. 2 describe the phenomena we are compelled to assume that though any detail which we perceive may appear superficially to be an isolable physical or chemical phenomenon, yet the isolation is only apparent, and the phenomenon is really an aspect of the particular form of maintained co-ordination which we call a life. By an artificial process of abstraction we can neglect its maintained co-ordination which we see, and this is what we do when we endeavour to interpret the phenomena physically or chemically.

p. 42 The phenomena of life are regarded as occurring blindly, without foresight or retrospect, and merely as co-ordinated maintenance or reproduction of a specific life. This co-ordinated maintenance involves continuous adaptation to changing circumstances, ...

p. 44 Vitalism was an attempt to take the co-ordinated maintenance into account, Except quite superficially, the phenomena observed in living organisms cannot be interpreted as mere physical and chemical processes, The latter processes are interpreted as separable events in separable units of material, and in consequence of this the quite evidently maintained co-ordination or wholeness of life cannot be expressed in terms of these.

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It appears clearly to me that what made their position untenable was the first fact that, following the trend of their times, they accepted that the ultimate validity of physical and chemical interpretation outside the bodies of 'living' organisms. Once this is admitted, we find that we are driven to admit also that life must be regarded as a physical and chemical process. But this brings us back again to the old difficulty.

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The mistake of the vitalists, and of the essentially similar 'organistic' or 'organismal' biologists, was, as I have repeatedly tried to point out in previous writings, to separate a living organism from its environment. The maintained co-ordination is present, just as much in the relations between organism and environment as in the relations between the parts of an organism itself. We cannot separate in space the phenomena of life from those of its environment.

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Our experiences of degrees of brightness are thus experiences of life itself, and cannot be interpreted in terms of the conception that they merely express the result of action upon us of changes in an external physical environment. When we describe them as experiences of objective brightness or illumination existing independently of experience of them, we are only applying a convenient hypothesis or artifice, which is far from completely expressing the observed facts.

p. 58

From lack of any sufficient appreciation of the significance of contrast, physiologists, since the times of Galileo and Newton, have been content to accept as sufficient the purely physical conception of a surrounding visible universe. Kant did so also When we realize, for example, that in our 'dressing' the blue sky we are also making it blue, our attitude to the 'nature' which we see around us becomes very different.

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We have found ourselves in this perceived world, and in no mere generalized philosophical sense such as Kant pointed out, but in a much more concrete sense related to ourselves as individuals,

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We can regard this scale as objective, but it has no concrete apart existence apart from our experience These are our standards, in so far as our experience of them is maintained under certain definite conditions.

they only remain constant

p.60 We refer measurements of mass and illumination to standards which represent sense experiences under certain constant conditions, but in treating them as mass and illumination in a physical sense we neglect this fact.

It is the same with all physical measurements, including those of space and time.

p.61 But the basis of physical measurement is always a sensible unit, the sensible constancy of which depends on the maintained constancy of the physiological conditions under which it is experienced.

... when we consider the manner of this entry we find that they are playing a part in the maintenance of the organism's life. They are guiding the actions which aim themselves up in this maintenance on the maintenance of the organism's race.

We can neglect these aspects of sensory experiences, and we do so in physical interpretation. This is, however, a mere matter of practical convenience in certain limited connexions. For biological interpretation these limitations are not present.

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Biological interpretation covers the whole of our perceived universe ... On this point we must definitely break with any phylophilosophy which, in the manner of vitalism, interprets our universe of experience as made up of a scattered picture in which we find here what is purely physical, there what is biological Physical interpretation, in so far as we adhere to it, is applicable to the whole of our perceived experience. But so is biological interpretation At each level of interpretation the whole of our experience is covered. Inasmuch, however, as in biological interpretation we are taking our experience more fully into account than in physical interpretation, biological interpretation is on a higher level, and represents reality less incompletely than physical interpretation.

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The fact that the life of an organism extends over its environment implies that the lives of different organisms, although they are distinguishable, enter into each other's lives. There is no spatial separation between the lives of different organisms, just as there is no spatial separation within the life of any one organism.

but vision
in biology

..... For biology the universe appears as a universe of individual lives, each of which is regarded separately.

p.67

From the standpoint of relativity physics every element in the universe of our experience has its existence in its relations to other elements. From the biological standpoint also each phenomenon in the life of an organism has its existence in relation to the other phenomena of life.

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p.65 We have just as good a right to consider the biologically interpreted world to be a directly perceived world of common sense as we have to consider the physically interpreted world in this manner.....

What we interpret biologically is the same perceived world as we can also, if we look, as Descartes and Kant did, less closely, endeavour to interpret physically In reality, however, the two sorts of interpretation are different

p.66 When we find that any detail of structure or activity enters into the coordinated life of an organism we have reached the biological interpretation or perception of this detail; and it is this kind of interpretation that biological science seeks.

p.67 Life is from its very nature incapable of being described or understood in terms of mere physical conceptions. It is not biology, but physics, that from the biological standpoint is an 'inexact' science,

p.67 Vitalists, to apply physical and biological conceptions simultaneously. For biological interpretation the physical conception of energy has lost its meaning, since the environment of an organism is no longer regarded as a physical environment.

We come to realise, moreover, that apart from their co-ordination and maintenance biophysical and biochemical phenomena are devoid of interest to biologists. It is the ~~fact~~ fact of their co-ordination and maintenance as manifestations of life that gives them their significance.

p.72 The rejection of the mechanistic conception of life carries with it the rejection of the theory that life has originated out of mechanical condition.

p.73 It seems to me that this conception (Emergent Evolution) only hides away the gap which exists between mechanical and biological interpretation. No degree of physical and chemical complication brings us in any way nearer to the phenomena of life or conscious experience.

It is only in the light of the distinctly biological conception of a life which embraces environment that evolution can be interpreted. Acquisition of a new character is always a distinctly biological phenomena, just as life itself is.

p.75 We can thus consider life as continuously evolving, though from the standpoint of biology alone there is no meaning in discussing whether evolving forms of life are in any way better or more beautiful, since values have no meaning for biology.

p.77 Life is, however, not something ~~about~~ apart from physical reality, but only the same reality seen and interpreted more fundamentally, and including within itself the chaotic details which we cannot directly interpret biologically.

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